
Neurodegenerative disease and adult neurogenesis.

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Public Summary:

When an embryo's brain develops, new nerve cells are added to the young brain, but super numerous cells are eliminated. Very similar processes are observed throughout life in specific regions in the adult brain, in the hippocampus and in the ventricle wall. Here new nerve cells are continuously added to the brain and this process is called adult neurogenesis. Neurodegenerative diseases, such as Parkinson's disease, Huntington's disease and Alzheimer's disease are known for death of nerve cells in specific brain regions. But in addition it was observed, that in these diseases less new nerve cells are generated in the hippocampus and in the ventricle wall. Rarely, in neurodegenerative diseases alterations in genes that hold the information to build and maintain an organism's cell have been found. These genes (α -synuclein, presenilin-1, tau, huntingtin) have been further studied to study neurodegenerative disease. Here it was noted, that these genes also are involved in brain development in the embryonic and adult. Importantly, it was found that in some neurodegenerative diseases, adult neurogenesis in the neurogenic areas such as the hippocampus and ventricle wall/ olfactory bulb system are decreased. Interestingly, these alterations are paralleled by early stage symptoms such as depression or smell deficits in many cases.

Scientific Abstract:

The generation and cell death of newly generated cells have critical roles in brain development and maintenance in the embryonic and adult brain. Alterations in these processes are also seen in neurodegenerative diseases. Genes that are key players in neurodegenerative diseases (α -synuclein, presenilin-1, tau, huntingtin) are also physiologically involved in modulating brain plasticity. Interestingly, in some neurodegenerative diseases, the specific alterations in neurogenic areas such as the dentate gyrus and subventricular zone/olfactory bulb system parallel the early or premotor symptoms that are seen in the early stages of these diseases, such as depression, anxiety or olfactory dysfunction. We will review the modulation of neurogenesis in animal models and human brains of Parkinson's disease, Huntington's disease and Alzheimer's disease.

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